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EXAMINER

DOVE, TRACY MAE

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/914,517

Applicant(s)

WELSCH ET AL

Examiner

Tracy Dove

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 15-26 and 28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14, 27 and 29-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 6/18/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

This Office Action is in response to the communications filed on 8/27/04 and 12/13/04. Applicant's arguments have been considered, but are not persuasive. Claims 1-32 are pending. Claims 15-26 and 28 are withdrawn as being directed toward a non-elected invention.

#### ***Drawings***

The objection to the drawings is withdrawn.

#### ***Priority***

Note this application claims benefit to provisional application 60/124,443 filed on 3/15/99. The provisional application has been reviewed by the Examiner to determine if the disclosure of the invention in the provisional application is sufficient to entitle Applicant to the priority date. The provisional application has sufficient disclosure and Applicant is entitled to the priority date of 3/15/99.

#### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted on 6/18/04 has been considered by the examiner.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-14, 27 and 29-32 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. An oxidation/reduction reaction critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In*

Art Unit: 1745

*re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). The claims recite “a battery” and a battery is defined as a device that converts the chemical energy contained (stored) in its active materials directly into electric energy by means of an electrochemical oxidation-reduction (redox) reaction. This type of reaction involves the transfer of electrons from one material to another through an electric circuit (Linden, Handbook of Batteries, page 1.3). The specification does not enable a battery comprising active materials that undergo a redox reaction. It appears the specification is describing a “capacitor”, but using the term “battery”. Furthermore, claim 27 recites “accessible to reactants with reaction paths”, which is not enabled by the specification. The active materials (reactants) of a battery do not flow through “reaction paths”. Fuel cells have reactants that flow through reactant paths, but fuel cells are not considered batteries. Batteries contain stored chemical energy via the active materials, while fuel cells do not store the chemical energy. Fuel cell reactants flow through the fuel cell, but are not “stored” in the fuel cell.

Claim 32 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a specific surface area of  $40 \text{ m}^2/\text{cm}^3$ , does not reasonably provide enablement for a specific surface area of at least  $40 \text{ m}^2/\text{cm}^3$ . The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention commensurate in scope with these claims. The specification as filed does not provide support for “at least”  $40 \text{ m}^2/\text{cm}^3$ . Specifically, all values above  $40 \text{ m}^2/\text{cm}^3$  are not supported by the disclosure.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 1745

Claims 1-14, 27 and 29-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term "a battery" in claims 1-14, 27 and 29-32 is used by the claim to mean "a capacitor", while the accepted meaning is "a device that converts the chemical energy contained in its active materials directly into electric energy by means of an electrochemical oxidation-reduction (redox) reaction." The term is indefinite because the specification does not clearly redefine the term.

Claim 1 recites "a width of less than 1 micrometer", which is unclear. As shown in Figures 2-4, the dendrites have a tapered shape. Thus, it is unclear how the "width" of the dendrite is obtained.

Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: it is unclear how the reactant paths are configured in the claimed battery.

The term "a different material" in claims 29 and 30 is a relative term which renders the claims indefinite. The term "a different material" is not defined by the claims, the specification

Art Unit: 1745

does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The claims do not recite what "a different material" is different from.

To the extent the claims are understood in view of the 35 U.S.C. 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraph, rejections above, note the following prior art rejections.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-14, 27 and 29-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Welsh et al., US 6,226,173.

Welsh teaches an electrical device comprising an anode formed from a directionally grown sponge. The electrical device may be a power supply (1:10-19). Lithium ion batteries are electrical devices (2:3-5). The electrical device comprising the anode, a cathode and an electrolyte (2:43-48). The sponge is formed by a method which includes growing dendrites on a substrate (2:51-52). The electrodes may include a single layer of dendrites or a double layer of dendrites (5:41-46). The dendrites include an element select such as copper, silver, aluminum and alloys thereof (2:53-59). The dendrites have a width of about 30 micrometers or less (preferably 1 micrometer or less) and a pore size of 30 micrometers or less (4:53-60). The dendrites are perpendicular or near perpendicular to the substrate to minimize electrical

Art Unit: 1745

resistance (4:62-66). The electrode includes interdendritic spaces that provide surface access to an oxidizing agent (reactant/reaction path). The substrate may be formed from the same material as the sponge, or a different material. The substrate may be in the form of a ribbon, wire, case structure or sheet. Substrates of silver, copper or aluminum are preferred (4:43-52). The dendrites may have a layer of a dielectric material (different material) thereon that spaces the dendrites from the electrolyte (4:30-32). The anode has a high surface area of at least  $10 \text{ cm}^2/\text{gm}$  (claim 41). The electrically conductive dendrites may have smaller, secondary dendrites, growing from the surfaces (4:62-66).

Thus the claims are anticipated.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 6-8, 10, 12-14, 27 and 29 are rejected under 35 U.S.C. 102(e)/103(a) as being anticipated by, and alternatively unpatentable over, Bando et al., US 5,965,295.

Bando teaches an alkaline secondary battery comprising a positive electrode, a negative electrode and an alkaline electrolyte. The positive electrode includes an active material applied to a conductive substrate (metallic porous body). The metallic porous body may be formed of a sponge-like, fibrous or felt-like metallic porous body which is made from a metal such as nickel or stainless steel, or a nickel-coated resin (col. 7, lines 7-10). The negative electrode includes an active material applied to a conductive substrate. The conductive substrate may be a two-

Art Unit: 1745

dimensional substrate such as a punched metal, expanded metal and a nickel net, or a three-dimensional substrate such as a felt-like porous metallic substrate or a sponge-like porous metallic substrate (col. 7, lines 51-55). A laminate structure comprising the two-dimensional substrate and the three-dimensional substrate applied to the surfaces of the two-dimensional substrate may be employed as the conductive substrate of the negative electrode or the positive electrode (col. 11, lines 62-col. 12, lines 6 and col. 11, lines 24-35). Bando teaches a sponge-like three-dimensional substrate which was made of nickel and applied on the opposed surfaces (plural layers) of a two-dimensional substrate (nickel sheet) to prepare a conductive substrate. The three dimensional substrate employed in an example of Bando was 0.8 mm is thickness, 98% in porosity and 100 g/m<sup>2</sup> in weight per unit area (col. 33, lines 5-14).

Regarding claims 10, 12 and 13, the three-dimensional sponge substrate of Bando inherently contains dendrites because it is a three-dimensional material with a porosity of 98%.

Regarding claim 14, the three-dimensional sponge substrate is coated with a positive active material layer or a negative active material layer. Both the positive active material layer and the negative active material layer contain electrically conductive material.

Thus the claims are anticipated.

The claim is alternatively unpatentable because the courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. In re Fessman. Bando does not explicitly state the three-dimensional sponge material is grown on the two-dimensional substrate. However, this is a product-by-process claim and is therefore obvious.

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Claims 5 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bando et al., US 5,965,295 in view of Reichman et al., US 6,171,726 B1 and/or Kimiya et al., US 6,013,390.

Bando teaches an alkaline secondary battery comprising a positive electrode, a negative electrode and an alkaline electrolyte. The positive electrode includes an active material applied to a conductive substrate (metallic porous body). The metallic porous body may be formed of a sponge-like, fibrous or felt-like metallic porous body which is made from a metal such as nickel or stainless steel, or a nickel-coated resin (col. 7, lines 7-10). The negative electrode includes an active material applied to a conductive substrate. The conductive substrate may be a two-dimensional substrate such as a punched metal, expanded metal and a nickel net, or a three-dimensional substrate such as a felt-like porous metallic substrate or a sponge-like porous metallic substrate (col. 7, lines 51-55). A laminate structure comprising the two-dimensional substrate and the three-dimensional substrate applied to the surfaces of the two-dimensional substrate may be employed as the conductive substrate of the negative electrode or the positive electrode (col. 11, lines 62-col. 12, lines 6 and col. 11, lines 24-35). Bando teaches a sponge-like three-dimensional substrate which was made of nickel and applied on the opposed surfaces (plural layers) of a two-dimensional substrate (nickel sheet) to prepare a conductive substrate. The three dimensional substrate employed in an example of Bando was 0.8 mm is thickness, 98% in porosity and 100 g/m<sup>2</sup> in weight per unit area (col. 33, lines 5-14).

Bando does not explicitly state the two-dimensional substrate comprises silver, copper or aluminum (claim 5). Bando does not explicitly state the three-dimensional sponge material comprises copper, silver, gold, aluminum or combinations thereof.

However, Reichman teaches an alkaline battery comprising an electrode including an electrically conductive substrate used to hold an active material. Examples of substrates include foam, grid, plate, foil, expanded metal or any other type of support structure. The electrically conductive material of the substrate may be nickel, nickel alloy, copper, copper alloy, nickel-plated metals such as nickel-plated copper and copper plated metal nickel (col. 5, lines 66-col. 6, lines 14).

Furthermore, Kimiya teaches an alkaline battery comprising an electrode including a foamed nickel substrate filled with an active material. The substrate may be foamed nickel or other three-dimensional metal porous substrates like nickel felt or two-dimensional metal porous plates. The nickel substrate may be nickel with at least one metallic element selected from the group consisting of Mn, Al, Co, Cr, Fe, Zr and Bi (col. 13, lines 37-44).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have been motivated to modify the composition of the conductive substrate of Bando because the actual material used for the substrate depends upon many factors including whether the substrate is being used as the positive or negative electrode, the potential of the electrode and the pH of the electrolyte (Reichman col. 6, lines 10-14). One of skill would have been motivated to combine the teaching of Bando with Reichman and/or Kimiya because all three references teach conductive substrates for alkaline batteries. Reichman teaches a nickel-copper conductive substrate for use in alkaline cells is known in the art. Kimiya teaches a nickel-aluminum conductive substrate for use in alkaline cells is known in the art.

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Claims 11 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bando et al., US 5,965,295.

See discussion of Bando above regarding claims 1-4, 6-8, 10, 12-14, 27 and 29.

Bando does not explicitly state the width of the individual dendrites.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because changes in size/proportion, in the absence of a showing of criticality, are considered obvious. The courts have held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. See MPEP 2144.04.

### ***Response to Arguments***

Applicant's arguments filed 8/17/04 have been fully considered but they are not persuasive.

Regarding claim 6, Applicant argues Bando's three dimensional substrate is formed by infiltration of a foam and thermally decomposing the foam (method). Applicant asserts the result is a relatively coarse material which does not possess the large accessible surface area which can be achieved by forming particles of a foam and attaching these to a substrate. However, claim 6 does not contain any limitations regarding the surface area of the sponge material. Furthermore, applicant has not supported the assertion that Bando "does not possess a large accessible surface area". Examiner suggests Applicant file a declaration if they are attempting to show the claimed

Art Unit: 1745

invention has unexpected results over the prior art. Unexpected results must distinguish the claimed invention over the prior art of record.

Regarding claim 7, again Applicant presents arguments relating to the surface area of the sponge material. However, claim 7 does not contain any limitation regarding surface area. Furthermore, Applicant provides no support or evidence for the assertion that large surface areas are not achievable by the method of Bando. The claimed invention does not contain any limitation regarding "power available" or "resistance". Furthermore, Examiner requests that Applicant provide the calculations and material used to produce the asserted result in the middle of page 12 of the amendment filed on 8/27/04.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1745

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Tracy Dove', with a stylized, flowing script.

Tracy Dove  
Patent Examiner  
Technology Center 1700  
Art Unit 1745

March 3, 2005